Characterization of the Titanium Dioxide Nanoparticles

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Abstract:

This research aims to study an effect of annealing nanosize titanium dioxide (**Ti**O_2), Titanium dioxide (**Ti**O_2) is a wide gap oxide semiconductor is an n-type due to oxygen deficiency. It has three phases of the crystal structures including anatase, brookite, and rutile, where the band gap is 3.2 eV for brookite, 3.2 eV for anatase, and 3.0 eV for rutile. The most stable form and the principal source of (**Ti**O_2) are rutile. The metastable anatase and brookite will transform to the thermodynamically stable rutile upon calcination at temperatures exceeding 600oC.

In all three forms, titanium (**Ti**O_4) atoms are coordinated to six oxygen (O_2) atoms, forming (**Ti**O_6) octahedra.

Utilize six grams of (**Ti**O_2) material beige color was tope down divided for two parts one was annealed to 600oC for 4 hours and another let without annealing.

The as-prepared samples were further characterized using devices studying (**Ti**O_2) properties, X-Ray Diffraction (XRD), Fourier Transformation Infrared Red (FTIR) and USB Spectrometer.

As 0.25g from both samples was taken and put in (FTIR) to reading transmission and absorption properties, 0.5g was taken for two samples put in (XRD), and 0.25g from both samples was taken and used UV-Visible Spectroscopy (USB) to take the readings.

After the properties of the annealed sample were studied and compared to the raw (control powder), this properties were found that the color of the Titanium Dioxide has changed from beige into white as the last one showed fewer impurities and formed **Ti-O-Ti** vibrational mood which was absent in the control sample.

The band gap was recorded and found to be 2.567 eV and 2.568 eV for control and annealed samples respectively.

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